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ABSTRACT

The resumption of skilled performance following a period of no practice is often characterized by motor activity of a lower quality than that demonstrated prior to the rest period. This phenomenon, termed warm-up decrement, is usually brief, lasting for only a few trials or minutes of postrest practice. This study attempted to determine the effect of cognitive and behavioral warm-up activities on immediate and delayed postrest warm-up decrement in a softball batting task. It was predicted that practice immediately prior to postrest performance of a task having the same activity set as the criterion task should eliminate warm-up decrement on the criterion task. In addition, it was expected that warm-up decrement would be reduced or eliminated for subjects engaging in relevant task imagery or in physiologically arousing activity at the end of the rest interval. Subjects were 40 female softball players, all judged to be very good batters. All subjects were administered Nideffer's Test of Attentional and Interpersonal Style and a Vividness of Visual Imagery Questionnaire (Marks, 1973). The experiment involved four stages: (1) 20 pretest batting trials; (2) 10 minutes of rest and reading followed by 5 minutes of a specified warm-up activity; (3) 10 batting trials; and (4) a 5-minute warm-up and 10 batting trials six months later. The results suggest support for the expected outcomes. (MT)

The Effect Of Arousal and Focused Attention On Warm-Up Decrement

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Running Head: WARM-UP DECREMENT

The Effect of Arousal and Focused Attention on Warm-up Decrement

The resumption of skilled performance following a period of no practice is often characterized by motor activity of a lower quality than that demonstrated prior to the rest period. This phenomenon, termed warm-up decrement (WUD), is usually brief, lasting for only a few trials or minutes of postrest practice.

While various explanations for WUD have been proposed (for reviews see Adams, 1961; Schmidt, 1971), the one receiving the greatest support in motor skills experiments has been the activity-set hypothesis (Nacson & Schmidt, 1971). According to this view, WUD is the result of the loss over rest of a non-habit internal state (the activity set) which is characterized as a generalized readiness to respond. It is assumed that a number of systems comprise the activity set, some of which are supportive of the to-be-performed motor response. Postulated systems include the arousal system, the speed-accuracy tradeoff, the attention to important sources of feedback, and the establishment of expectancies for upcoming events.

During motor skill practice the relevant underlying systems of the activity set are presumably adjusted to promote optimal conditions for performance. However, a rest period brings with it a readjustment of these systems which if left unattended will effect postrest WUD. Thus, the WUD period is assumed to be the length of time or number of trials it takes the performer to adjust the relevant underlying systems to the level they were near the end of the prerest practice bout.

Two important predictions of the activity-set hypothesis deal with the type of warm-up activities that might be practiced near the end of a rest period just prior to the resumption of criterion task performance.

Specifically, it is predicted that the practice of a task having the same activity set (i.e., one with similar relevant underlying mechanisms) as the criterion task immediately prior to postrest performance should reinstate the appropriate activity set and eliminate WUD on the criterion task. Conversely, practicing a task having a different activity set than that for the criterion task would be expected to instate an inappropriate activity set, resulting in increased WUD on subsequent criterion task practice.

Support for the activity-set hypothesis has been obtained in several experiments using criterion laboratory tasks of force estimation (Nacson & Schmidt, 1971), linear positioning (Nacson & Schmidt, 1971; Schmidt & Wrisberg, 1971). In a recent field experiment designed to determine more specifically the type of adjustments necessary to reduce WUD, Anshel (1985a) found that interpolated activities designed to increase arousal at the end of a rest interval eliminated WUD (relative to a no warm-up control group) on a hand-spring vaulting skill. In a second study (Anshel, 1985b), WUD on a criterion baseball batting task was eliminated by practicing with a dynamic mechanical batting device (i.e., hitting balls projected vertically from ground level into the contact area) at the end of a rest interval but not by practicing with a static device (i.e., hitting balls placed on a batting tee). A possible explanation for the latter results is that the attention of subjects practicing with the dynamic batting device was readjusted to a level more appropriate for criterion batting performance than was that of

the group practicing with the more static batting tee. Thus, it appears that the contribution of attentional focus as an underlying system of the activity set deserves further investigation.

The topic of attentional focus has enjoyed a good deal of recent popularity in the field of sport psychology, due primarily to the work of Nideffer (1976a, 1976b, 1980a, 1980b). Of relevance to the present investigation is the notion that the performance of any given task is enhanced by a proper attentional focus. For example Nideffer (1976b) has suggested that a baseball batter should adopt a narrow, external focus in order to facilitate the prediction and timing of a pitched ball.

One way attentional focus might be sharpened is by mental rehearsal or imagery of a criterion act. Of particular utility appears to be first person or internal imagery in which subjects attempt to "feel" themselves performing and to "see" environmental cues through their own eyes (Mahoney & Avener, 1977). From the standpoint of warming-up activities prior to the resumption of criterion task performance it might be expected that successful imagery of relevant performances cues would facilitate the adjustment of attentional mechanisms appropriate to subsequent practice. Conversely, imaging irrelevant performance cues would be expected to contribute to an inappropriate adjustment of attentional mechanisms, resulting in increased WUD with the resumption of criterion task practice.

The purpose of this study was to ascertain the effect of cognitive and behavioral (physiological arousal) strategies on the reduction or elimination of WUD. It was expected that WUD would be reduced or eliminated only for the groups engaging in relevant task imagery or in physiologically arousing

activity at the end of the rest interval. Conversely, the postrest performance of subjects practicing irrelevant imagery was predicted to have the highest WPD. Similar performance outcomes were predicted 6 months later.

Method

Subjects

Forty female students at New Mexico State University (NMSU) volunteered to participate in the study. Twenty-four were current or former members of the University's women's softball team and 16 participants were judged as elite intramural players at NMSU. All subjects were "very good" batters as determined from initial screening by the head and assistant coaches of the team. The mean age of all subjects was 20.9 years with range of 18.6-22.8 years. During the time course of the study all participants were free of injuries that might inhibit their batting performance. As discussed in the next section, the assignment of subjects to each of the four groups was based on three criteria: attentional style, batting skills, and imagery ability.

Materials and Equipment

Test of Attentional and Interpersonal Style (TAIS). All subjects were administered Nideffer's (1976B) Test of Attentional and Interpersonal Style two weeks prior to the study to assess their attentional profile and to permit an assignment of subjects to groups that was balanced for attentional competencies. Subjects' scores on two of the subscales of the TAIS were used to determine group assignment. Since it was assumed that successful batting performance required a narrow,external attentional focus subjects' scores for

the "overloaded by external stimuli" (OET) and narrow attentional focus" (NAR) subscales were obtained. It was expected that an appropriate focus for batting would be most easily achieved by subjects who scored low on the OET factor (indicating a resistance to overloading and confusion caused by external stimuli) and high on the NAR factor (indicating an ability to narrow attentional focus when necessary). Not unexpectedly, a Spearman rho correlation performed on subjects' scores for these two factors revealed a high negative relationship (r =-.84). A stratified sampling technique was then used to assign subjects to groups, beginning with those scoring lowest on the OET factor and highest on the NAR factor.

Batting Skill. Upon completion of the TAIS, each subject engaged in 10 batting trials in the presence of two collegiate baseball coaches who assured batting skill. The subjects were ranked according to their score on a Likert-type scale ranging from 1 (poor) to 4 (excellent). The coaches were "blind" to the treatments, ranking, and group assignment for each subject. The mean rankings of the four groups were essentially identical (M =3.26).

Vividness of Visual Imagery Questionnaire (VVIQ). The Vividness of Visual Imagery Questionnaire (Marks, 1973) was also administered to subjects to determine the clarity with which they felt they could construct a visual image. Subjects were given 16 statements describing objects or events and were asked to rate the clarity with which they were able to image the object/event. Ratings ranged from a score of "1" (indicting an image that was as clear and vivid as typically experienced with normal vision) to one of "5" (indicating an inability to construct an image). It was originally intended

to use VVIQ scores to further balance the assignment of subjects across the four groups. However, 36 of the 40 subjects scored below a "2" ($\underline{M}$ = 1.87, SD = .19) on the VVIQ and the remaining subjects' scores were between 2.10 and 2.26. These uniformly low scores on the VVIQ were presumably due to the fact that all subjects had been trained in the use of visual imagery 6 months prior to the study using techniques suggested by Harris and Harris (1984). Thus, it was assumed that all subjects were fairly comparable in imagery skills and that the four groups were balanced for this factor.

Pitching machine and softballs. A Ponza Hummer Softball Pitching Machine was used to deliver each pitch to subjects during criterion task practice. The machine was situated a distance of 40 feet from home plate and was set to project the ball at a velocity of 65 mph. Regulation size (12 in., 6 oz.) softballs were used throughout criterion task performance.

Procedures

Subjects were tested at the team's outdoor field. The experiment was comprised of four phases: a) 20 prerest trials consisting of attempts to hit the pitched ball as solidly as possible in fair territory, b) 15 minutes of interpolated activity involving 10 minutes of rest and the reading of selected articles in a baseball magazine and 5 minutes of the respective warming-up activities (or continued rest and reading by control subjects), c) 10 immediate postrest trials with the pitching machine, and d) a 5 minute warm-up and 10 delayed postrest trials with the pitching machine after an extended lay-off of 6 months. Subjects were not apprized of the additional trials 6 months later.

The data were collected by non-participant volunteers and consisted of a) successful or unsuccessful contact on each trial (success was defined as any hit travelling through the area between first and third base), b) distance (to the nearest foot) the ball travelled on each successful hit, and c) subjective ratings by two coaches on the quality of the batter's swing for each successful contact. The coaches used a Likert-type scale ranging from a score of "1" (poor) to "4" (excellent). Interrater reliability calculated for the judge's ratings was .97.

Treatment conditions. The forty subjects were evenly assigned to one of four groups (n = 10 per group). Prior to the resumption of criterion task performance (i.e., during the last 5 minutes of both the 15-minute rest interval and the 6-month extended lay-off) each subject received one of four types of activity. Control subjects (C) rested and read selected articles in a baseball magazine. These subjects were told that they might be required to answer questions about the material in the articles at a later time. This instruction was designed to prevent mental rehearsal of the criterion batting task. A second group of subjects performed an activity designed to heighten physiological arousal (PA) prior to criterion task practice. Specifically, each subject pedalled a stationary bicycle with a predetermined resistance designed to raise the heart rate to approximately 50% of predicted maximum; calculated as 220-subject's age x .5 (Astrand, 1977). This level of intensity was chosen because it has been shown to involve aerobic processes while establishing a steady state in

which oxygen demands of the tissues are met by an adequate blood supply, resulting in no physical fatigue. A confederate engaged in conversation with each subject during biking activity to reduce the possibility of using imagery at this time.

The remaining groups performed imagery activities that were either relevant or irrelevant to the criterion task. Guidelines for the proper imagery technique were those suggested by Harris and Harris (1984). A relevant imagery (RI) condition was instructed to close the eyes and use first person imagery to focus attention on the most relevant cues used while batting. These cues, which were determined by the head coach, included an image of the ball in the pitcher's hand, the point of ball release, rotation and speed of the approaching pitch, the moment of ball contact, and the path of the batted ball. Subjects were instructed to visualize the batting situation in slow motion for 5 pitches and then at regular speed for the remaining time.

An irrelevant imagery, (II) condition followed the same protocol as that used for the relevant imagery condition except for the event that was imaged. Specifically, subjects were instructed to focus attention on the most relevant cues used while catching a fly ball. These cues, again determined by the coach, included an image of the ball approaching the batter, the point of contact, the pathway of the approaching fly ball, and the moment of successful interception. Subjects were told to image the first 5 fly balls in slow motion and the remainder at normal speed. In addition, they were instructed

to "field" fly balls that were hit alternately to their right and to their left.

Imagery subjects were asked to assess the quality of their image by completing the VVIQ after the second and fourth minutes of the treatment. The average VVIQ scores (calculated over both imagery sessions) were 1.38 (SD = .74) for the RI condition and 1.56 (SD = .41) for the II group. Thus, it was assumed that both groups were successful in constructing their respective images.

Results

Heart Rate

The heart rates (HRs) of subjects in each group were obtained by digital palpation for 6 seconds at the end of each of the 5 minutes prior to the resumption of batting performance. The mean HRs were 126, 68, 71 and 65 for conditions PA, RI, II, and C, respectively. Not unexpectedly the average heart rates of subjects in the PA condition were significantly ($p < .05$) higher than those of the remaining groups which did not differ from each other. Thus, it appeared that the procedures designed to heighten arousal in the former condition were effective. Moreover, any difference in criterion batting performance of the imagery groups and the control condition after the resumption of practice could not be attributed to differences in the level of physiological arousal for those groups.

Frequency of Successful Contacts

The frequency of successful contacts for each condition on each of the 20 prerest trials are presented in Table 1.

Insert Table 1 about here

Chi-square analyses performed on each of the 20 trials revealed no significant differences in the frequency of successful contacts among the four conditions on any trial (Note: An expected frequency of 10 was used for each analysis).

In order to determine the efficacy of the various warm-up activities performed prior to the resumption of batting practice, chi-square analyses were conducted on each of the 10 trials following the 15 minute interval (Trials 21-30) as well as on the 10 trials after the 6 month lay-off (Trials 31-40). The expected frequency used for each of these analyses was 9.65 which was the average frequency of contact by all groups on the last 5 trials of prerest batting practice. The obtained frequencies for each condition on each of the two sets of postrest trials (i.e., Trials 21-30 and 31-40) are presented in Table 2.

Insert Table 2 about here

Inspection of the frequency of successful contacts for each group on the first postrest trial following the 15-minute rest interval suggested the presence of WUD in both groups C and II. However, no WUD was apparent for either conditions PA or RI. Not surprisingly, the chi-square analysis on Trial 21

revealed a significant difference in the frequency of contacts among the four conditions, X 2 (3) = 9.24, p - < .05. While the same frequency trend was evident on Trial 22, there was : no significant difference in the number of successful contacts among conditions on this or on any of the remaining trials. Six months later the resumption of batting performance following respective warming-up activities revealed a slight trend toward WUD in the C and the RI conditions. However, no significant intergroup differences in frequency of successful contacts was obtained on any trial.

Distance

The mean distance (ft.) and standard deviation that successful hits travelled on each of the 20 prerest trials as well as on the two sets of 10 postrest trials are presented in Table 3. A 4 (groups) x 20 (trials) ANOVA with repeated measures on the second factor was performed on the prerest scores. Significant main effects were found for groups, F (3,36) = 3.88, p < .05, and for trials, F (19, 593) = 14.52, p < .01. Subsequent Newman-Keuls analysis of the groups effect revealed that the mean distance score of the control condition was significantly lower than that of the II condition. No other significant pairwise

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Insert Table 3 about here

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contrasts were obtained. As expected the performance of all groups improved over practice with no significant differences in the distance scores on the last five prerest trials.

In order to determine whether significant differences existed in the amount of immediate postrest WUD among the groups, a 4 (groups) x 10 (trials) ANOVA with repeated measures on the second factor was performed. The dependent measure for this analysis was the distance score of each subject on each postrest trial minus the mean of that subject's distance scores for the last five prerest trials (Table 3). The primary rationale for use of a difference score is that presumably WUD is a decrement score (i.e., negative difference between pre-and postrest performance; see Schmidt & Wrisberg, 1971 and Anshel, 1985 for a similar calculation of WUD). Thus, a negative value on any postrest trial would reflect the amount of WUD on that trial.

For the immediate postrest trials (T 21-30), significant effects were obtained for groups F (3, 36) = 8.30, $p < .01$; trials, F (9,282) = 6.64, $p < .01$, and groups x trials, F (27, 282) = 2.02, $p < .01$. Inspection of the results on Trials 21-30 revealed improved performance by all groups over trials. More importantly, larger WUD scores were apparent for the C and the II conditions than for treatments PA and RI, particularly on the first few trials. Post hoc analyses indicated significant differences between the II and the RI conditions on Trial 21 ($p < .10$), Trial 22 ($p < .05$), and Trial 23 ($p < .10$). The WUD of the II treatment was also significantly higher than that of the PA condition on Trial 22 ($p < .10$), Trial 23 ($p < .05$), and Trial 24 ($p < .10$), and for the C condition on Trial 23 ($p < .10$). The only other significant ($p < .10$) pairwise difference was between the WUD scores of the C and the RI treatments on Trial 21.

The WUD scores for the various groups on delayed postrest trials (T 31-40) are presented in Table 3. Once again these data represent the mean (calculated over subjects) difference between the distance on each delayed postrest trial minus the average distance on the last 5 prerest trials. Significant effects were obtained for trials, F (9, 254) = 2.77, $p < .01$, and for groups x trials, F (27, 254) = 1.75, $p < .05$. Again, WUD diminished over trials for all but the II condition which registered positive (i.e., no WUD) difference scores on only two trials. However, post hoc analyses of the groups x trials interaction revealed no significant differences between the WUD scores of the groups on any trial. Figure 1 illustrates the trends for prerest, immediate postrest, and delayed postrest performance for distance.

Insert Figure 1 about here

Coaches' Ratings

A final measure of interest was that involving the frequency with which the coaches assigned each of the four ratings (1 = poor, 2 = fair, 3 = good, 4 = excellent) to subjects' swings on each successful contact. A 4 (groups) x 4 (rating category) chi-square analysis was performed on each of the 40 trials. The expected frequency for each cell was determined by the formula: row total x column total/grand total, and was calculated using the obtained frequencies for successful contacts on each trial.

Of particular interest was the fact that the only significant chi-square was that for Trial 21, $X^2 = 17.22$, $p < .05$. The means and standard deviations for the coach's ratings for each group for Trial 21 were 3.89 (1.11), 3.81 (1.64), 2.87 (1.47) and 2.14 (1.73) for groups PA, RI, II, and C, respectively. Thus, there was a relatively higher frequency of "good" ("3") and "excellent" ("4") ratings for the successful contacts of subjects in the PA and RI conditions than for those subjects in the C and RI groups. These results suggest that the quality of swings used by subjects in the former groups to achieve successful contacts during postrest trials were of a generally higher quality than those of subjects in the latter two conditions.

Discussion

The present study represented an attempt to determine the effect of various warm-up activities on immediate and delayed postrest warm-up decrement (WUD) in a softball batting task. The results suggest support for two predictions from the activity-set hypothesis proposed by Nacson and Schmidt (1971). The first prediction is that the practice of a task having properties of the activity-set similar to those of the criterion task immediately prior to postrest performance should eliminate WUD on the criterion task. In the present study postrest WUD in distance the batted ball travelled of subjects receiving relevant imagery practice (i.e., imaging themselves watching and hitting a pitched ball) prior to the resumption of criterion batting performance was significantly less than that of control (no warm-up) subjects on

the first immediate postrest trial (T 21). This finding is consistent with those reported in previous laboratory (Nacson & Schmidt, 1971; Schmidt & Nacson, 1971; Schmidt & Wrisberg, 1971) and field (Anshel 1985a) studies. In addition to reduced WUD for distance performance, the immediate postrest practice of relevant imagery subjects was also characterized by no reduction in the frequency of successful contacts nor by diminished ratings of coaches on the quality of the swing.

A second prediction of the activity-set hypothesis states that practicing a task having different neutral properties than those of the activity set of the criterion task immediately prior to postrest criterion task practice should heighten WUD. In the present study the postrest WUD in distance scores of subjects performing irrelevant imagery (i.e., imaging themselves watching and catching fly balls hit alternately to their right and left) was significantly higher than that of a) the relevant imagery conditions on each of the first three (T 21-23) immediate postrest trials, b) the arousal condition on the second through fourth (T 22-24) postrest trials, and c) the control condition on the third (T 23) postrest trial. Moreover, WUD for the irrelevant imagery condition in the present experiment was manifested by a lower frequency of successful immediate postrest ball contacts as well as lowered ratings by coaches regarding swing quality. These results are also consistent with trends reported in earlier WUD studies demonstrating increased WUD in the immediate postrest criterion task performance of subjects given inappropriate warm-up activities.

Of particular importance is the suggestion from the present findings that proper attentional focus may be an important property of the activity set. While replication of the present findings are needed in other field settings using a variety of sport skills, these results provide some evidence that pre-performance imagery of relevant task or situational cues may be one way to reduce the length of time it takes the performer to acclimate to game conditions. Such relevant attentional adjustments (Nideffer, 1976a, 1976b, 1980a, 1980b) would appear to be particularly important in sport situations involving the shuttling of players in and out of a game (e.g., substitutions in basketball or hockey, intermittent activity of placekickers and punters in football, etc.)

Mild support was also evidenced for the notion that arousal is a property of the activity set. While not as pronounced as the results of earlier work by Anshel (1985a) using a hand-spring vaulting skill as the criterion task, the present findings suggest that increased arousal diminishes postrest WUD to some extent on a batting task. The WUD for frequency of successful contacts of the arousal group was significantly less than that of the control conditions and the irrelevant imagery condition but not of the relevant imagery condition. The same trend was found for the coaches' rating of the quality of immediate postrest performance of the four groups. For WUD on the immediate postrest distance measure, the scores of the arousal condition were not significantly different from those of subjects in the control or relevant imagery conditions but were lower (on trials 22-24) than those of subjects in the irrelevant imagery condition. Thus, it appears that arousal adjustments may be somewhat important prior to the resumption of criterion batting performance.

In this study arousal was physiologically determined. Other investigations, however, have studied a psychological basis for arousal. Psychological arousal has received considerably less attention in the literature. It has been studied with respect to "psych up" cognitive strategies (Gould, Weinberg & Jackson, 1980) and positive feelings such as eagerness and excitement (Anshel, 1985a). Although Anshel noted a moderate and significant correlation between physiological arousal (derived through heart rate) and positive affectations leading to statistically superior performance outcomes, the benefits derived in the Gould et al, (1980) study were equivocal at best. Perhaps it may be surmised that the potential benefits of arousal on WUD, as noted in the present experiment, are a function of psychological responses. These include selectively attending to relevant environmental cues, heightened as Nacson and Schmidt (1971) point out, the salient properties (including self-confidence, and other self-regulatory strategies (see Kirschenbaum and Wittrock, 1984). arousal) of the activity set ay differ o varying extents across a variety of tasks. That is, the extent to high arousal (or any other property of the activity set or a particular task) is important to criterion performance will determine the amount of emphasis that should be placed on arousal adjustments prior to the resumption f criterion task practice.

Finally, the present results suggest that appropriate adjustments of the activity set may only be expected to reduce WUD following relatively brief rest periods. Specifically, no difference in delayed postrest criterion performance of subjects receiving the various warm-up activities was noticed on the 10 trials performed following a 6-month lay-off. Thus, decrements on these trials might be more appropriately categorized as forgetting (see Adams, 1961, fora discussion of habit and non-habit factors in retention loss).

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Footnote

One subject from the physiological arousal condition and one from the control condition left the university and were not included in this test session. The estimated obtained frequency for each of these subjects was the average frequency for the remaining subjects in each of their respective groups.

Table 1. Frequency of successful contacts for all prerest trials within each group.

Trials	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Groups																				
Arousal	8	6	8	10	8	10	9	9	10	9	10	10	10	9	10	10	10	9	9	10
Relevant Imagery	8	10	8	10	9	9	9	9	10	10	9	10	10	10	10	9	9	10	10	10
Irrelevant Imagery	5	6	7	7	9	5	8	10	9	9	9	9	10	10	10	10	10	10	10	10
Control	6	7	7	9	8	6	9	7	9	9	7	8	8	8	8	10	7	10	10	10

Table 2. Frequencies for successful contacts on postrest trials within each condition.

	Immediate WUD										Delayed WUD									
Trials	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Groups																				
Arousal*	9	9	9	10	9	9	10	10	10	10	8	7	7	7	6	8	6	8	8	8
Relevant Imagery	10	9	9	9	10	10	10	10	10	10	10	10	8	8	10	10	10	10	10	10
Irrelevant Imagery	3	7	10	8	10	8	10	10	10	10	8	7	7	9	9	10	9	10	10	9
Control*	3	4	8	10	9	8	10	9	10	10	6	6	8	8	8	7	7	7	7	7

n = 8 for delayed trials

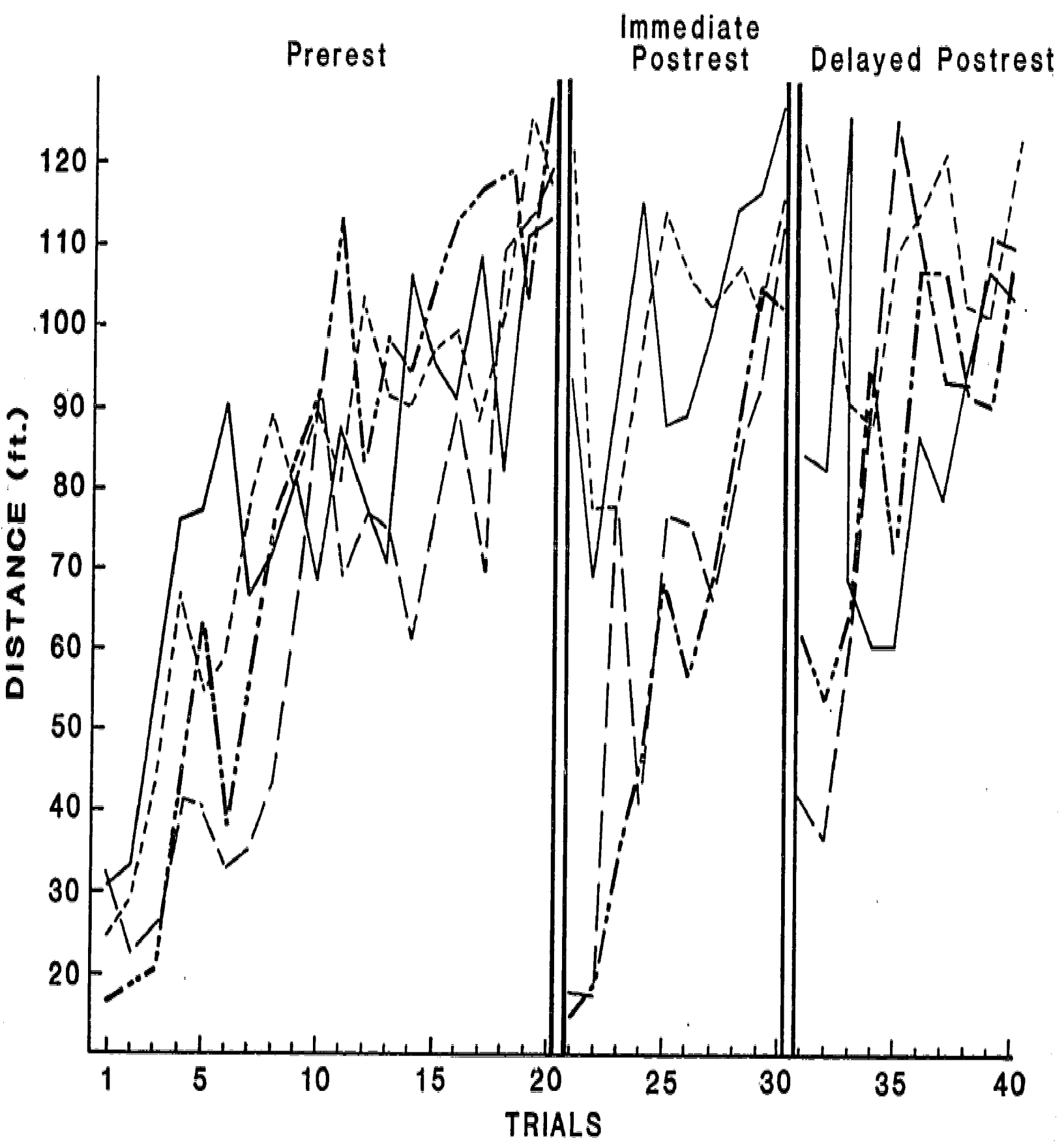
Table 3. Means and standard deviations of the distance (ft.) successful contacted hits travelled for 20 prerest trials and immediate postrest and delayed postrest trials.

Prerest Trials	1	2	3	4	5	6	7	8	9	10	11	12	13	15	16	17	18	19	20
Groups																			
Arousal	30.3 (29.8)	33.6 (40.6)	55.1 (69.4)	75.1 (16.0)	76.8 (59.0)	90.2 (42.6)	65.8 (40.7)	71.7 (61.1)	80.9 (39.9)	68.5 (61.9)	86.6 (52.9)	77.8 (53.9)	69.9 (63.4)	106.5 (49.7)	95.1 (43.0)	90.4 (39.C)	108.7 (27.8)	81.8 (45.5)	110.6 (44.7)	113.9 (36.2)
Relevant Imagery	24.0 (23.7)	29.3 (26.9)	43.1 (38.6)	65.9 (28.7)	55.3 (42.2)	59.8 (44.2)	78.0 (49.0)	89.8 (61.5)	70.2 (31.1)	89.8 (27.8)	80.2 (47.9)	103.2 (7.8)	91.3 (38.1)	90.9 (54.2)	95.8 (37.7)	92.1 (59.8)	87.0 (55.2)	101.2 (19.4)	125.6 (36.0)	117.0 (34.0)
Irrelevant Imagery	13.4 (19.0)	18.6 (23.4)	20.7 (23.5)	43.1 (34.6)	63.8 (54.1)	38.0 (46.8)	56.9 (46.1)	75.7 (29.6)	83.7 (35.9)	91.0 (53.7)	112.8 (49.0)	82.9 (46.8)	98.2 (29.3)	94.6 (18.8)	105.5 (21.5)	112.1 (24.9)	116.3 (24.0)	119.6 (21.9)	103.7 (24.4)	131.3 (37.7)
Control	31.1 (21.8)	22.10 (24.8)	25.9 (37.5)	41.4 (29.2)	39.2 (26.2)	33.4 (58.2)	35.2 (50.1)	43.9 (46.3)	67.1 (38.2)	91.0 (51.4)	69.2 (12.6)	77.2 (102.8)	75.3 (25.4)	82.3 (85.1)	77.4 (100.7)	89.6 (107.8)	69.7 (90.5)	108.5 (123.4)	112.2 (124.9)	119.5 (127.3)

	Immediate Postrest										Delayed Postrest									
Trials	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Groups																				
Arousal	93.4 (42.9)	69.4 (38.9)	91.5 (39.0)	115.1 (13.6)	87.4 (41.7)	89.7 (38.6)	99.4 (13.6)	114.4 (44.7)	116.3 (37.6)	127.8 (25.8)	83.6 (45.0)	82.3 (41.9)	68.6 (42.2)	60.3 (41.1)	60.6 (47.5)	86.6 (24.1)	78.7 (48.4)	94.0 (37.5)	105.8 (17.4)	103.5 (21.5)
Relevant Imagery	120.9 (30.2)	78.9 (52.5)	77.8 (46.0)	98.5 (38.4)	114.7 (24.8)	106.7 (17.8)	102.0 (24.7)	97.8 (36.8)	101.3 (36.6)	115.8 (22.1)	122.1 (39.5)	109.5 (44.3)	90.0 (53.3)	88.7 (55.6)	108.9 (37.5)	114.3 (35.2)	120.7 (49.5)	102.4 (61.3)	101.4 (39.2)	122.4 (31.1)
Irrelevant Imagery	15.6 (27.6)	18.8 (19.2)	34.2 (32.7)	46.8 (33.3)	67.6 (22.9)	56.7 (42.1)	68.3 (37.6)	87.3 (18.6)	102.3 (14.6)	101.8 (45.9)	61.1 (49.0)	54.3 (45.3)	65.3 (49.9)	94.7 (43.5)	72.4 (46.7)	106.4 (38.2)	106.7 (48.1)	91.4 (56.9)	89.9 (57.3)	106.3 (40.8)
Control	17.0 (44.6)	18.4 (32.7)	77.9 (101.8)	41.0 (56.5)	77.1 (93.9)	75.8 (92.1)	66.3 (81.5)	84.9 (104.4)	90.9 (102.6)	111.3 (122.1)	41.5 (35.1)	37.1 (36.4)	61.0 (32.5)	92.6 (19.4)	150.0 (37.0)	110.0 (51.6)	93.2 (49.4)	93.0 (56.2)	111.0 (54.6)	110.7 (51.0)

Figure Captions

Figure 1. Mean distance of successful hits for each group across all performance trials.


Prerest
Immediate Postrest
Delayed Postrest
DISTANCE (ft.)
120
110
100
90
80
70
60
50
40
30
20
1
5
10
15
20
25
30
35
40
TRIALS
Arousal
Relevant Imagery
Irrelevant Imagery
Control